

### **REMARKS**

This is in response to the Office Action of April 15, 2008. Claim 1 is amended to recite that acrylic rubber component (A) consists of 80 to 99.9% by weight of units of at least one monomer selected from the group consisting of acrylic acid ester monomers and methacrylic acid ester monomers, and 0.1 to 20% by weight of units of a monoester of an  $\alpha,\beta$ -ethylenically unsaturated dicarboxylic acid monomer having 3 to 11 carbon atoms with an alkanol having 1 to 8 carbon atoms. No new matter is introduced by this Amendment. Claims 1, 2, 4-11, 13 and 15-17 as amended are pending in the application.

#### **Prior art rejection**

1, 2, 4-11, 13, and 15-17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over US 5,965,640 (Kobayashi) in view of US 6,815,506 (Takashima '506) and JP 04-126738 (Takashima '738) and US 3,575,785 (McManimie). Office Action, pages 2-8. The rejection is respectfully traversed.

The present invention differs from the Kobayashi technology at least with respect to crosslinking systems and agents, acrylic rubber components, and silicate additives.

*Crosslinking systems and agents.* In the acrylic rubber composition disclosed in Kobayashi, crosslinking occurs between halogen-based cure sites of a halogen-containing acrylic rubber and a triazine thiol compound. Thus, it is essential that the acrylic rubber composition of Kobayashi comprises a halogen-containing acrylic rubber and a triazine thiol compound.

In contrast, in the acrylic rubber composition of the present invention, crosslinking of the acrylic rubber occurs between the carboxyl cure sites of the acrylic rubber and a polyamine crosslinking agent. Specification, page 16, lines 12-23. Thus, the acrylic rubber composition of the present invention comprises a carboxyl group-containing acrylic rubber comprising units of a monoester of a  $C_{3-11}$   $\alpha,\beta$ -ethylenically unsaturated dicarboxylic acid monomer with a  $C_{1-3}$  alkanol, and a polyamine crosslinking agent.

*Acrylic rubber components.* The acrylic rubber composition disclosed in Kobayashi comprises a halogen-containing acrylic rubber as an essential ingredient. The halogen-

containing acrylic rubber is made by copolymerization of alkyl alkylate and/or alkoxyalkyl alkylate with active halogen-containing monomer, or by halogenation of alkyl alkylate and/or alkoxyalkyl alkylate copolymer (col. 3, lines 9-28). Kobayashi teaches that other optional monomers may be copolymerized with the alkyl acrylate and/or alkoxyalkyl acrylate. There are multitudes of monomers listed as examples of the optional monomers (col. 4, line 28 - col. 5, line 7). Among the optional monomers, "a monoester of an  $\alpha,\beta$ -ethylenically unsaturated dicarboxylic acid monomer ... with an alkanol" is listed (col. 4, lines 52-54). The halogen-containing acrylic rubber comprises 30-99.9 wt. % of alkyl alkylate and/or alkoxyalkyl acrylate and 0-55 wt. % of the optional monomer (col. 5, lines 9-25).

In contrast, in the present invention, the acrylic rubber comprises 80-99.9 wt. % of acrylic acid ester and/or methacrylic acid ester, and 0.1-20 wt. % of a monoester of a  $C_{3-11}$   $\alpha, \beta$ -ethylenically unsaturated dicarboxylic acid monomer with a  $C_{1-3}$  alkanol.

*Silicate Additives.* The acrylic rubber of Kobayashi comprises a white filler with a pH of 2-10. The white filler includes, for example, white carbon (silica), Celite, talc, clay, calcined clay, and so on (col. 8, lines 6-17). In contrast, the acrylic rubber composition of the present invention comprises a combination of synthetic silica having a BET specific surface area of not larger than 200 m<sup>2</sup>/g, with aluminum silicate containing at least 5 wt. % of Al<sub>2</sub>O<sub>3</sub>, wherein the total amount of Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> is at least 60 wt. % based on the aluminum silicate. The incorporation of a combination of the specified synthetic silica and the specified aluminum silicate is neither specifically disclosed nor generically suggested in Kobayashi.

One benefit of the acrylic rubber composition of the present invention over the acrylic rubber composition disclosed in Kobayashi lies in its excellent storage stability. In this regard, the Examiner is requested to compare Examples 1 and 2 with Comparative Example 1. Examples 3-5 fall within the scope of original claim 1, but do not fall within the scope of current claim 1. The acrylic rubber composition in Comparative Example 1 comprises an active chlorine-containing acrylic rubber (i.e., a copolymer of n-butyl acrylate, 2-methoxyethyl acrylate, and vinyl chloroacetate), 2,4,6-trimercapto-s-triazine (i.e., a triazine thiol compound (2) recited in Kobayashi), and zinc dibutylidithiocarbamate (i.e., a dithiocarbamic acid derivative (3) recited in Kobayashi), and aluminum silicate. Thus, the acrylic rubber composition is similar to that disclosed in Kobayashi. The factual data shown in Table 1 reveals that the acrylic rubber

composition of the present invention (Examples 1 and 2) has excellent storage stability as compared with that of Comparative Example 1 which is closer to the Kobayashi disclosure.

*Takashima '506.* As pointed out by the Examiner, Takashima '506 discloses that the examples of inorganic filler for a rubber composition include silica, synthetic aluminum silica, and others (col. 8, lines 48-67). However, the rubber composition disclosed in Takashima '506 comprises an unsaturated group-containing acrylic rubber (B) comprising a structural unit derived from a monomer having a carbon-carbon double bond in a side chain (B2), and a crosslinking agent (E) (col. 2, lines 12-30). The examples of the crosslinking agent (E) preferably include sulfur, an organic sulfur-containing compound, and organic peroxides. Therefore, the acrylic rubber disclosed in Takashima '506 is different from that disclosed in Kobayashi in that the Takashima '506 rubber has carbon-carbon double bonds as the cure sites, but the Kobayashi rubber has halogen-based cure sites. Further, these prior art rubbers differ in that the former rubber comprises sulfur, an organic sulfur-containing compound, or an organic peroxide as the crosslinking agent, but the latter rubber comprises a triazine thiol compound as the crosslinking agent. Accordingly, due to the differences in the cure mechanisms of the acrylic rubbers between Takashima '506 and Kobayashi, there would be no motivation for substitution of inorganic fillers from one composition to the other.

Moreover, it is submitted that Takashima '506 is silent as to the incorporation of a combination of the specified synthetic silica and the specified aluminum silicate required by the present invention in the rubber composition. Therefore, even if there were motivation to substitute inorganic fillers between Takashima '506 and Kobayashi, the acrylic rubber of the present invention – comprising a combination of the specified synthetic silica and the specified aluminum silicate – would not be obvious.

In addition, it is to be noted that the acrylic rubber composition in Comparative Example 1, as mentioned above, is also similar to a hypothetical combination of Kobayashi with Takashima '506 – that is, the rubber composition comprising a chlorine-containing acrylic rubber, a crosslinking agent as recited in Kobayashi, and aluminum silicate recited in Takashima – which has poor storage stability as compared with that of the present invention.

*Takashima '738.* Takashima '738 discloses a rubber composition comprising a rubber having carboxylic acid groups and/or carboxylic acid ester groups, and silica having been treated

with an amino group-containing organosilane compound (claim 1). Takashima '738 discloses many crosslinking agents for acrylic rubbers. The following is a partial translation of a relevant passage (page 4, left lower column, line 12 to page 5, left upper column, line 12) of Takashima '738.

The crosslinking agent is usually any of those which are used as the crosslinking agent for rubbers and includes sulfur or its derivatives, organic peroxides, alkyl-phenol resins, and ammonium benzoate. Further, as the crosslinking agent, there can be used polyfunctional crosslinking agents having at least two functional groups capable of reacting with crosslinking sites contained in the rubber (A).

The organic peroxide used as the crosslinking agent includes, for example, 2,5-dimethyl-2,5-di(t-butylperoxy)-hexyne-3, ...[partially omitted]....

The polyfunctional crosslinking agents having at least two functional groups capable of reacting with crosslinking sites contained in the rubber (A) preferably include polyfunctional crosslinking agents having at least two functional groups selected from the group consisting of amino group, isocyanate group, maleimide group, epoxy group, hydroxyl group, mercapto group and carboxyl group. As examples thereof, there can be mentioned compounds such as diamines, polyamines, diisocyanates, dithiols, polyisocyanates, maleimides, diepoxides, diols, polyols, bisphenols and dicarboxylic acids.

As specific examples of the above-recited compounds, there can be mentioned N, N'-phenylenedimaleimide, hexamethylene diamine, 2, 2-bis(4'-hydroxyphenyl) propane, 2,2-bis (4'-hydroxyphenyl) hexafluoropropane and triazine trithiol).

Takashima JP '738 discloses that the rubber composition has excellent heat resistance, but suggests nothing about storage stability.

The acrylic rubber disclosed in Takashima '738 is different from that disclosed in Kobayashi in that the former rubber has carboxyl groups or carboxylic ester groups as cure sites, but the latter rubber has halogen-based cure sites. Due to the difference in the cure mechanisms of the acrylic rubbers, there is no motivation to substitute the triazine thiol compound as the crosslinking agent of Kobayashi by the crosslinking agent of Takashima '738. Further, it would not be obvious to select a polyamine crosslinking agent in particular from the numerous crosslinking agents recited in Takashima '738. Additionally, it would not be obvious to incorporate the polyamine crosslinking agent together with a combination of the specific synthetic silica and the specific aluminum silicate, as used in the present invention, in the rubber.

*McManimie*. With respect to *McManimie*, the Examiner contends only that it is *prima facie* obvious to make an aluminum silicate component an “aluminum silicate containing SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> with the claimed range as taught by *McManimie* ... because such aluminum silicate can be successfully used as a reinforcing material.” Office Action, pages 4-5. Thus, the *McManimie* reference is not alleged by the Examiner to remedy the deficiencies of the remaining references outlined above.

Summary of traversal of prior art rejection

The acrylic rubber component recited in claim 1 as amended hereinabove is clearly distinguished from that described in Kobayashi, and is neither described nor suggested in the other references applied by the Examiner. Therefore, claim 1 and the claims depending from claim 1 are not obvious over the combination of Kobayashi, Takashima '506, Takashima '738, and *McManimie*.

(1) Acrylic Rubber

The acrylic rubber composition taught by Kobayashi comprises halogen-containing acrylic rubber as an essential ingredient. In contrast, the acrylic rubber required by the present invention consists of acrylic acid ester monomer units and/or methacrylic acid ester monomer units, and  $\alpha,\beta$ -ethylenically unsaturated dicarboxylic acid monomer units. Thus, the acrylic rubber component of Applicants' claims does not have active halogen-containing monomer units. The acrylic rubber required by the present invention comprises units of an  $\alpha,\beta$ -ethylenically unsaturated dicarboxylic acid monomer. The Takashima '506, Takashima '738, and *McManimie* references are silent as to an acrylic rubber comprising such dicarboxylic acid monoester monomer units. Thus, the combination of Kobayashi, Takashima '506, Takashima '738, and *McManimie* – considered together – fail to teach or suggest the acrylic rubber component required by Applicants' claims as amended herein.

(2) Crosslinking System

In the acrylic rubber compositions disclosed in Kobayashi, crosslinking occurs between

halogen-based cure sites of a halogen-containing acrylic rubber, and a triazine thiol compound. In contrast, the acrylic rubber required by the present invention does not have halogen-based cure sites, and crosslinking of the acrylic rubber occurs between carboxyl cure sites of the acrylic rubber and a polyamine crosslinking agent. Specification, page 16, lines 12-23.

### (3) Crosslinking Agent

With regard to the limitation of crosslinking agent in Applicants' claim 1, the Examiner contends that it is obvious to substitute polyamine crosslinking agents described in Takashima '738 for the crosslinking agents taught by Kobayashi based on their recognized equivalency. He contents in this regard that all of these crosslinking agents are functional equivalents which can be substituted for one another. The Examiner's position is not accurate. Takashima '738 teaches that many kinds of crosslinking agents conventionally used in rubber industry can be used, but that crosslinking agents should be selected depending upon the particular type of rubber. Page 4, left column, line 12 through page 5, right column, line 2. For instance, Takashima '738 expressly teaches:

In the case when the rubber (A) is an elastomer having a halogen group introduced therein, polyaminecarbamates, organic carboxylic acid ammonium salts or organic carboxylic acid alkali metal salts, and triazine compounds can be used.

Page 5, left column, line 18 to right column, line 2. Takashima '738 teaches nothing about whether all of these crosslinking agents are functional equivalents and can be substituted for each other. Takashima '738 teaches nothing about the substitution of the triazine thiol compound of Kobayashi for a polyamine crosslinking agent. Moreover, even if a polyamine crosslinking agent is substituted for the triazine thiol compound in Kobayashi, the acrylic rubber composition of the present invention will not result, because of the difference of the acrylic rubber of the present invention from that of Kobayashi.

### (4) Silicate Additive

None of the cited references suggest the incorporation of a combination of the specific synthetic silica component (B) required by Applicants' claims with the specific aluminum

silicate component (D) required by Applicants' claims in an acrylic rubber.

(5) Storage Stability

A benefit of the acrylic rubber composition of the present invention over that disclosed in Kobayashi lies in the excellent storage stability of the present composition. The Examiner has failed to establish that this benefit would be present in an acrylic rubber composition comprising the specified acrylic rubber, a polyamine crosslinking agent, and a combination of the specified synthetic silica with the specified aluminum silicate.

Accordingly, in view of the present amendment to the claims and in view of the remarks hereinabove, Applicants respectfully submit that the subject matter of claim 1, as well as that of all claims dependent thereupon, is not taught or suggested by the cited prior art.


Contact information

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Richard Gallagher (Registration No. 28,781) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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